

**SUPPLEMENTAL FOURTH FIVE-YEAR REVIEW REPORT FOR
TEX TIN CORPORATION SUPERFUND SITE
TEXAS CITY, GALVESTON COUNTY, TEXAS**



April 2018

Prepared by

**U.S. Environmental Protection Agency
Region 6
Dallas, Texas**

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**Supplemental Fourth Five-Year Review Report
Tex Tin Corporation Superfund Site
EPA ID No. TXD062113329
Texas City, Galveston County, Texas**

This memorandum documents the U.S. Environmental Protection Agency's performance, determinations, and approval of the Tex Tin Corporation Superfund Site (Site) Supplemental Fourth Five-Year Review (FYR) under Section 121(c) of the Comprehensive Environmental Response, Compensation, and Liability Act, 42 U.S.C. § 9621(c), as provided in the attached Supplemental Fourth Five-Year Review Report. This supplemental review is necessary to assess the protectiveness of the implemented remedy for Operable Unit 4; which was inadvertently omitted from the September 25, 2015, Fourth Five Year Review.

Summary of the Supplemental Fourth Five-Year Review Findings

The selected remedy for Operable Unit (OU) 4 included:

- Segmented wave barriers (or rock jetties) totaling 5,200 feet; to minimize future releases of contaminated sediments and marsh sediments. This has reduced exposure to contaminated sediments to ecological receptors
- Operations and Maintenance (O&M) to ensure integrity of the segmented wave barriers; and make repairs as necessary.

This remedy was selected to reduce exposure to contaminated sediments for ecological receptors. The completed structure was a four-segment, crushed quarry rock breakwater approximately 5,900 feet in length. The breakwaters are located just east of the shell islands that form the east boundary of Swan Lake. The rock jetties, built to prevent erosion and release of contaminants from the salt marsh area, are functioning as intended. Information from the Texas Parks and Wildlife also indicates that no erosion of the marsh area is occurring, and the marsh has successfully met the goals of the remedy for the site. Five year reviews should be continued to ensure that the remedy remains protective for ecological exposure to contaminated sediment in the long term.

Based on the information available during the supplemental Fourth FYR, the selected remedy for OU 4 is performing as intended, and is protective of human health and the environment.

Actions Needed

Continue to monitor the rock jetties and marsh area to ensure that marsh erosion is not occurring that may release contaminants to the environment.

Determinations

The Tex Tin Corporation site remedy for OU 4 is protective of human health and the environment.

Ronald D. Conlanel

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Carl E. Edlund, P.E.

Director, Superfund Division

U.S. Environmental Protection Agency Region 6

7/25/18

Date

CONCURRENCES:

SUPPLEMENTAL FOURTH FIVE-YEAR REVIEW REPORT
TEX TIN CORPORATION SUPERFUND SITE
EPA ID NO. TXD062113329



Philip Allen, U.S. Environmental Protection Agency
Remedial Project Manager

4/10/18

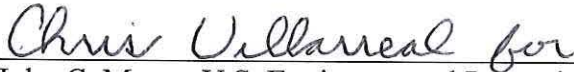
Date



Carlos Sanchez, U.S. Environmental Protection Agency
Chief, Arkansas/Texas Section

4/10/18

Date



John C. Meyer, U.S. Environmental Protection Agency
Chief, Remedial Branch

4/12/2018

Date



Pam Travis, U.S. Environmental Protection Agency
Attorney, Office of Regional Counsel

04/18/2018

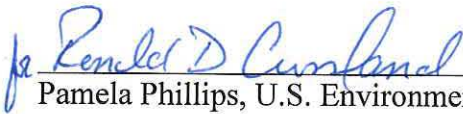
Date



Mark Peycke, U.S. Environmental Protection Agency
Chief, Superfund Branch, Office of Regional Counsel

04/23/18

Date



Pamela Phillips, U.S. Environmental Protection Agency
Deputy Director, Superfund Division

9/25/18

Date

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LIST OF ABBREVIATIONS & ACRONYMS

BHHRA	Baseline Human Health Risk Assessment
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
COC	Contaminant of Concern
EPA	United States Environmental Protection Agency
ERA	Ecological Risk Assessment
FYR	Five-Year Review
NPL	National Priorities List
OU	Operable Unit
PRGs	Preliminary Remediation Goals
PRPs	Potentially Responsible Parties
RAOs	Remedial Action Objectives
ROD	Record of Decision
TBC	To Be Considered
UU/UE	Unlimited Use/Unrestricted Exposure

I. INTRODUCTION

The purpose of a Five-Year Review (FYR) is to evaluate the implementation and performance of a remedy in order to determine if the remedy is and will continue to be protective of human health and the environment. The methods, findings, and conclusions of reviews are documented in five-year review reports such as this one. In addition, FYR reports identify issues found during the review, if any, and document recommendations to address them.

The U.S. Environmental Protection Agency (EPA) is preparing this five-year review pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 121(c), consistent with the National Contingency Plan (40 CFR Section 300.430(f)(4)(ii)), and considering EPA policy.

This is the supplemental fourth FYR for the Tex Tin Corporation Superfund Site. The triggering action for this **statutory** review was the signing of the previous FYR on September 25, 2015. This supplemental FYR has been prepared because hazardous substances, pollutants, or contaminants remain at the Operable Unit No. 4 site above levels that allow for unlimited use and unrestricted exposure (UU/UE). Given the nature of the remedy, there was uncertainty whether a Five-Year Review was required for OU 4. After further development of EPA policy, the determination was made to perform this supplemental FYR. Also, the Operable Unit will be included in future FYRs. The next site-wide review will be conducted in 2020.

The Site consists of four Operable Units (OUs), one of which includes the Swan Lake Marsh. That Operable Unit is addressed in this FYR. The three OUs that are not addressed in this FYR were addressed in the Fourth Five-Year Review Report signed on September 25, 2015 (EPA 2015b). (References are listed in Appendix A.)

The Tex Tin Corporation Superfund Site Five-Year Review was led by Philip Allen of EPA, who is the Remedial Project Manager for the Site. The review began on April 20, 2016.

Site Background

The Site is composed of these four OUs:

- OU 1 – former main tin smelter area;
- OU 2 – former smelter-related area located east of OU 1, purchased by Amoco Chemical Company (currently BP);
- OU 3 – residential area approximately 2,000 feet west and northwest of the former smelter area in the City of La Marque, Texas; and
- OU 4 – Swan Lake Marsh Area.

OU 1, OU 2, and OU 4 are within or adjacent to areas of heavy industry such as petrochemical plants and situated in low-lying, flat terrain near Galveston Bay. OU 3 is a residential area near the industrial areas. Future land uses at all OUs are expected to be consistent with recent past uses.

The Swan Lake Marsh Area consists of the area between the hurricane levee and the shell barrier islands separating Swan Lake from Galveston Bay, and includes portions of Swan Lake, its associated salt marsh habitats, and the Wah Chang Ditch east of Loop 197. The selected remedy for OU 4 consists of segmented wave barriers, which will minimize future releases of contaminated sediments and marsh sediments (see figure in Appendix B). EPA signed the Record of Decision (ROD) for OU 4 on September 27, 2001.

FIVE-YEAR REVIEW SUMMARY FORM

SITE IDENTIFICATION		
Site Name: Tex Tin Corporation		
EPA ID: TXD062113329		
Region: 6	State: TX	City/County: Texas City, Galveston County
SITE STATUS		
NPL Status: Final		
Multiple OUs? Yes	Has the site achieved construction completion? Yes	
REVIEW STATUS		
Lead agency: EPA <i>[If "Other Federal Agency", enter Agency name]:</i>		
Author name (Federal or State Project Manager): Philip Allen		
Author affiliation: U.S. EPA Region 6		
Review period: 9/21/2010 - 9/30/2017		
Date of site inspection: 8/3/2016		
Type of review: Statutory		
Review number: 4		
Triggering action date: 9/21/2010		
Due date (five years after triggering action date): 9/21/2015		

II. RESPONSE ACTION SUMMARY

Basis for Taking Action

Metals contamination associated with the former Tex Tin smelter are present at OU 4. The identified Contaminants of Concern (COCs) are aluminum, arsenic, cadmium, chromium, cobalt, copper, iron, lead, manganese, mercury, nickel, silver, tin, and zinc. The contaminants detected in the highest concentrations and identified as primary COCs were chromium, copper, lead, tin, and zinc. OU 4 is a marsh area associated with the Swan Lake ecological system. It is anticipated that it will remain a marsh area in the future. There are no known plans for its future development. The COCs may be affecting sediment-dwelling invertebrate organisms and omnivorous mammals through direct contact with or ingestion of sediment containing metals. The COCs do not pose a threat to human health.

Response Actions

A detailed Ecological Risk Assessment (ERA) was conducted for the Swan Lake Salt Marsh area, OU 4, and completed in September 1998 by U.S. EPA. The purpose of the Swan Lake Salt Marsh ERA was to evaluate the risk posed by existing levels of contamination. The ERA included sampling of in-situ water, benthic macroinvertebrates, and sediments. In 1999, additional surface sediment sampling was conducted to further determine the extent of contamination in the salt marsh area. The EPA completed this sampling effort and presented the results in the Final Report for the Tex Tin Site Swan Lake Marsh. The results of this sampling were used to identify the area and volumes of soil contaminated with hazardous substances.

The OU 4 ROD (EPA 2001) described the Remedial Action Objectives (RAOs) which included:

- Protect offsite sediment-dwelling invertebrate organisms and omnivorous mammals from direct contact with or ingestion of sediment containing metals at concentrations greater than the remediation goals.
- Prevent release of chemicals from the Swan Lake Salt Marsh to Swan Lake where they would accumulate in sediments or water to levels greater than the remediation goals.
- Prevent direct contact with or human ingestion or inhalation of sediments with metals concentrations greater than the Preliminary Remediation Goals for OU 1.
- Minimize destruction of existing benthic macroinvertebrate ecosystem when addressing the contaminants of concern.

As described in the Record of Decision (ROD), the remedy consisted of segmented wave barriers with length totaling approximately 5,200 feet. The wave barrier core would consist of quarry rock, concrete rubble, or other stable construction materials. The wave barrier core would include a filter fabric and uniformly graded rip-rap along the top and sides. The typical wave barrier section would have a crown width of approximately 8 feet and a 3 (horizontal) to 1 (vertical) slope.

Cleanup levels were not identified in the OU 4 ROD. The contaminant concentrations at OU 4 are not considered highly toxic or mobile and the principal threat wastes for the Site are being treated as part of the OU 1 remedial action at the former smelter facility, which was the original source of OU 4 contamination.

Status of Implementation

EPA achieved Construction Completion for the Tex Tin Corporation Superfund Site with the signing of the Closeout Report on September 20, 2004. Construction cleanups have been completed for all four operable units that comprise the Tex Tin Superfund Site, including the wave barriers at OU4 (EPA 2015a). No institutional controls were required under the OU4 ROD.

III. PROGRESS SINCE THE LAST REVIEW

Table 1: Protectiveness Determinations/Statements from the Third FYR in 2010

OU #	Protectiveness Determination	Protectiveness Statement
Sitewide	Short-term Protective	The remedy implemented at the Tex Tin Superfund Site protects human health and the environment in the short term. Long-term protectiveness of the remedy will be verified by continued monitoring in OU 1 of the Shallow Transmissive Zone, Medium Transmissive Zone, and Deep Transmissive Zone and in OU2 of the Shallow Transmissive Zone to verify that there is no further degradation of the groundwater outside the OUs boundaries. In addition, continued implementation of institutional controls and the necessary actions to address the issues discussed in this FYR report will be conducted.

OU 4 was not addressed as part of the Third FYR and there were no issues and recommendations associated with OU 4 in the Fourth FYR.

IV. FIVE-YEAR REVIEW PROCESS

Community Notification, Involvement & Site Interviews

An electronic press release was issued by EPA on 12/2/2014, wherein EPA listed 22 Superfund sites undergoing FYRs. The Tex Tin site was among those sites. No additional public notice was made available for this supplemental FYR.

During the primary FYR process leading up to completion of the Fourth FYR, interviews were conducted with parties associated with the Site. Those interviewed included representatives of the Potentially Responsible Parties (PRPs), the Mayor of Texas City, and the Texas Commission on Environmental Quality. The interviews are documented in the Fourth Five-Year Review Report (EPA 2015b). None of them mentioned any concern about OU 4. Additional interviews were not conducted as part of this supplemental five-year review.

Data Review

Data related to OU 4 has not been collected during the last five years. It is not a necessary component of the remedy.

Site Inspection

The inspection of the Site was conducted on 8/3/2016. In attendance were Mr. Philip Allen, EPA Remedial Project Manager; Mr. Bob Piniewski, Project Navigator, representing the PRPs; Dr. Jon Rauscher, EPA risk assessor; Mr. Barry Forsythe, U.S. Fish and Wildlife; Mr. Dan Kirk, Shell Oil Products, Inc.; and Mr. Ted Telisak, EA Engineering, Science, and Technology, Inc. The purpose of the inspection was to assess the protectiveness of the remedy. The Site Inspection Checklist is included as Appendix C. Photographic documentation of the Site inspection is included as Appendix D.

The condition of the wave barriers was evaluated during the Site inspection. They were found to be in good condition, capable of protecting the shore and marsh area and thereby preventing releases of contaminated sediments.

After the inspection was performed, and before this supplemental FYR was finalized, Hurricane Harvey

hit the Texas Gulf coast. Therefore, it was determined that further analysis was necessary to ensure the integrity of the wave barriers had not been compromised as a result of the hurricane. An extensive analysis was performed in mid-summer of 2018. The analysis revealed that there was no negative impact from the hurricane.

V. TECHNICAL ASSESSMENT

QUESTION A: Is the remedy functioning as intended by the decision documents?

Remedial Action Performance

The wave barriers are intended to prevent future shore erosion, abating further releases of contaminated ditch sediments and marsh sediments and by reducing exposure to contaminated lake sediments. During the site inspection, the wave barriers were found to be in good condition and capable of functioning as intended.

QUESTION B: Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of the remedy selection still valid?

Question B Summary:

Changes in Standards and “To Be Considered” (TBC) Requirements

This FYR did not identify newly-promulgated standards or TBCs that would affect the protectiveness of the remedy at OU 4.

Changes in Toxicity and Other Contaminant Characteristics

Risk values identified in the 1998 Final Ecological Risk Assessment are consistent with more recent sediment toxicity data and they are still valid. Toxicity values for risk-based Preliminary Remediation Goals (PRGs) determined for OU 1 soil and sediment have not changed since completion of the OU 1 Amended ROD.

Changes in Risk Assessment Methods

While there have been refinements to the EPA’s ecological risk assessment methodology since the 1998 Final Ecological Risk Assessment, none of these changes bear on the protectiveness of the selected remedy. A human health risk assessment was not performed for OU 4 because COC concentrations were below the PRGs determined for OU 1. Since completion of the 1997 Baseline Human Health Risk Assessment (BHHRA), the EPA has updated risk assessment guidance for dermal and inhalation exposures (EPA 2004, 2009). EPA also revised exposure parameters for various human receptors (EPA 2011, 2014). However, many of the exposure parameters presented in the revised guidance are similar to those used in the 1997 BHHRA. A primary change in default exposure parameters that may result in changes is the difference assumed for default body weight. EPA revised the default adult body weight from 70 kg to 80 kg. The increase in default adult body weight would result in lower overall cancer risks and non-cancer hazards for potential COCs. Therefore, changes in human health risk assessment methodology would not affect the protectiveness of the remedy.

Changes in Exposure Pathways

No changes in land use, expected land use, human health and ecological route of exposure and receptors have been identified during this review. There are no newly-identified contaminants or contaminant sources or unanticipated toxic byproducts of the remedy. The physical Site conditions and understanding of the Site conditions have not changed in a way

that could affect the protectiveness of the remedy.

QUESTION C: Has any other information come to light that could call into question the protectiveness of the remedy?

In September 2008, Hurricane Ike made landfall at Galveston Island, a few miles from the Site. As it reached Galveston, Ike was a Category 2 hurricane, with winds of 110 miles per hour and a storm surge of about 15 feet. However, the 2016 review of the condition of the wave barriers found them to be in excellent condition. Various scientific estimates indicate that sea level is rising anywhere from 0.6 inches to 1.4 inches per decade, and accelerated melting of ice caps has been projected to increase sea level by over 4 feet by the end of this century. Nonetheless, in 2016 the tops of the wave barriers were still more than a foot above the surface of the water at the time of the inspection. As yet, there is no indication that hurricanes or rising seas have significantly impacted the protectiveness of the remedy at OU 4, but this could change in the future and therefore periodic monitoring and evaluation should continue. No other information has come to light as part of this FYR that would call into question the protectiveness of the remedy.

VI. ISSUES/RECOMMENDATIONS

Issues/Recommendations
OU(s) without Issues/Recommendations Identified in the FYR:
OU 4

VII. PROTECTIVENESS STATEMENT

Protectiveness Statement
<i>Protectiveness Determination:</i> Operable Unit 4 Protective
<i>Protectiveness Statement:</i> The remedy at OU 4 currently protects human health and the environment because it prevents erosion of the barrier islands, the shore, and the marsh areas, thereby preventing releases of contaminated sediments. Continued protectiveness of the remedy should be verified through periodic monitoring of the condition of the wave barriers and inspection to verify there has been no significant erosion of the Swan Lake Salt Marsh.

VIII. NEXT REVIEW

The next site-wide five-year review report for the Tex Tin Corporation Superfund Site will be completed by September 25, 2020, five years after the signature of the last Five-Year Review report.

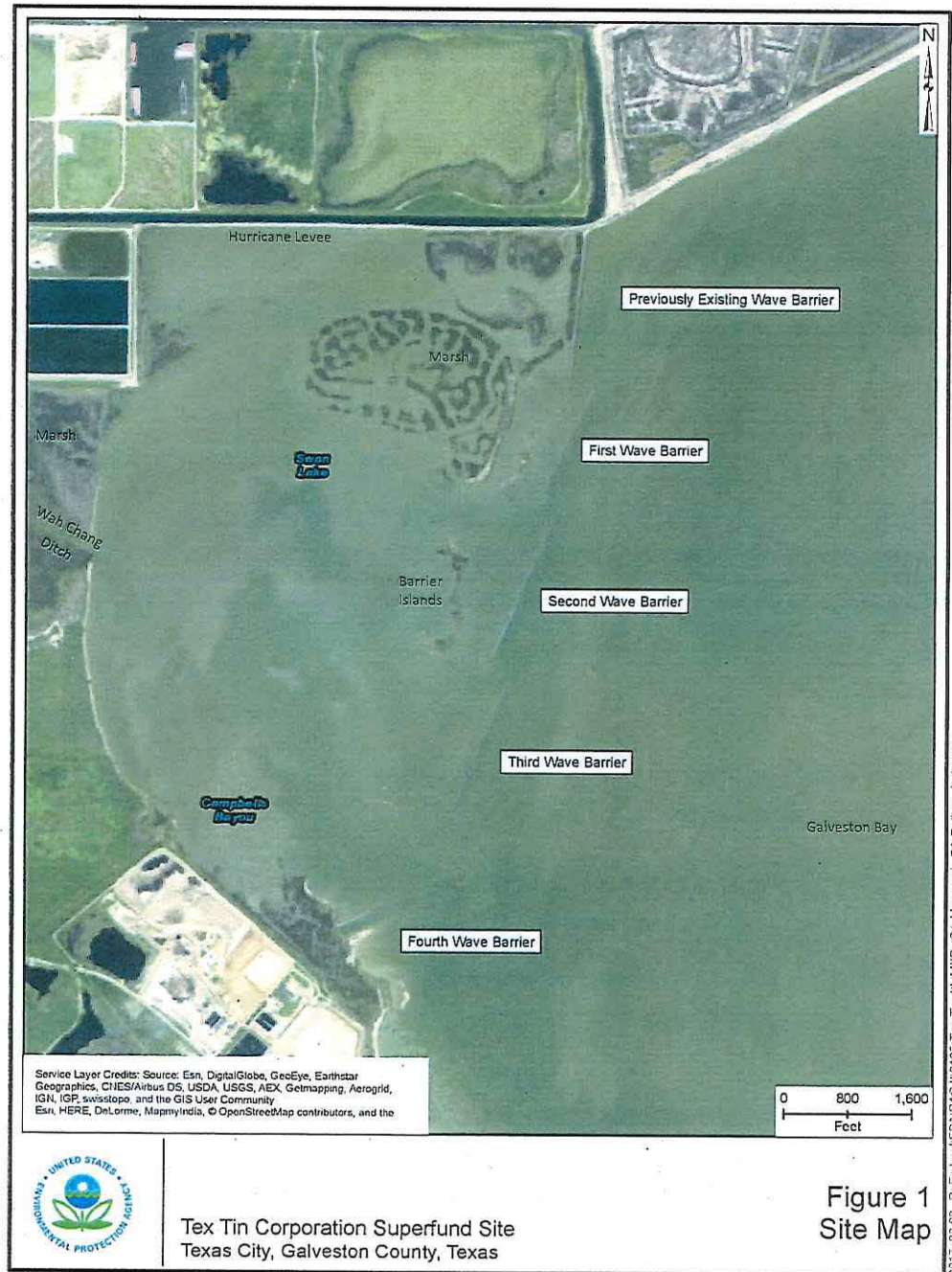
APPENDIX A – REFERENCE LIST

U.S. Environmental Protection Agency (EPA). 2001. *Record of Decision. Tex Tin Corporation Superfund Site, Operable Unit No. 4, Galveston County, Texas City, Texas. Site ID #TXD062113329.* September.

EPA. 2015a. *Site Status Summary. Tex Tin Corporation Superfund Site. Texas City, Galveston County, Texas.* August. <https://cumulis.epa.gov/supercpad/cursites/csitinfo.cfm?id=0602105>

EPA. 2015b. *Fourth Five-Year Review Report for Tex Tin Corporation Superfund Site. Texas City, Galveston County, Texas.* September.

APPENDIX B – SITE FIGURE



APPENDIX C – SITE INSPECTION CHECKLIST

Please note that "O&M" is referred to throughout this checklist. At sites where Long-Term Response Actions are in progress, O&M activities may be referred to as "system operations" since these sites are not considered to be in the O&M phase while being remediated under the Superfund program.

Five-Year Review Site Inspection Checklist (Template)

(Working document for site inspection. Information may be completed by hand and attached to the Five-Year Review report as supporting documentation of site status. "N/A" refers to "not applicable.")

I. SITE INFORMATION			
Site name: <u>TEX TIN OU4</u>		Date of inspection: <u>3 AUGUST 2016</u>	
Location and Region: <u>Texas City, TX Region 6</u>		EPA ID: <u>TXD 062113329</u>	
Agency, office, or company leading the five-year review: <u>EPA Region 6</u>		Weather/temperature: <u>Clear 95°F</u>	
Remedy Includes: (Check all that apply) <input type="checkbox"/> Landfill cover/containment <input type="checkbox"/> Monitored natural attenuation <input type="checkbox"/> Access controls <input type="checkbox"/> Groundwater containment <input type="checkbox"/> Institutional controls <input type="checkbox"/> Vertical barrier walls <input type="checkbox"/> Groundwater pump and treatment <input type="checkbox"/> Surface water collection and treatment <input checked="" type="checkbox"/> Other <u>Wave barriers</u>			
Attachments: <input type="checkbox"/> Inspection team roster attached <input checked="" type="checkbox"/> Site map attached			
II. INTERVIEWS (Check all that apply)			
1. O&M site manager _____			
Name _____		Title _____	Date _____
Interviewed <input type="checkbox"/> at site <input type="checkbox"/> at office <input type="checkbox"/> by phone		Phone no. _____	
Problems, suggestions; <input type="checkbox"/> Report attached _____			
2. O&M staff _____			
Name _____		Title _____	Date _____
Interviewed <input type="checkbox"/> at site <input type="checkbox"/> at office <input type="checkbox"/> by phone		Phone no. _____	
Problems, suggestions; <input type="checkbox"/> Report attached _____			

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency _____
Contact _____

Name	Title	Date	Phone no.
Problems; suggestions; G Report attached _____			

Agency _____
Contact _____

Name	Title	Date	Phone no.
Problems; suggestions; G Report attached _____			

Agency _____		_____	
Contact _____		_____	
Name _____	Title _____	Date _____	Phone no. _____
Problems; suggestions; G Report attached _____			

Agency _____
 Contact _____

Name	Title	Date	Phone no.
Problems; suggestions; G Report attached _____			

4. Other interviews (optional) G Report attached.

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)				
1.	O&M Documents G O&M manual G As-built drawings G Maintenance logs Remarks _____	G Readily available G Readily available G Readily available	G Up to date G Up to date G Up to date	G N/A G N/A G N/A
2.	Site-Specific Health and Safety Plan G Contingency plan/emergency response plan Remarks _____	G Readily available G Readily available	G Up to date G Up to date	G N/A G N/A
3.	O&M and OSHA Training Records Remarks _____	G Readily available	G Up to date	G N/A
4.	Permits and Service Agreements G Air discharge permit G Effluent discharge G Waste disposal, POTW G Other permits Remarks _____	G Readily available G Readily available G Readily available G Readily available	G Up to date G Up to date G Up to date G Up to date	G N/A G N/A G N/A G N/A
5.	Gas Generation Records Remarks _____	G Readily available	G Up to date	G N/A
6.	Settlement Monument Records Remarks _____	G Readily available	G Up to date	G N/A
7.	Groundwater Monitoring Records Remarks _____	G Readily available	G Up to date	G N/A
8.	Leachate Extraction Records Remarks _____	G Readily available	G Up to date	G N/A
9.	Discharge Compliance Records G Air G Water (effluent) Remarks _____	G Readily available G Readily available	G Up to date G Up to date	G N/A G N/A
10.	Daily Access/Security Logs Remarks _____	G Readily available	G Up to date	G N/A

IV. O&M COSTS																																																															
1.	O&M Organization G State in-house G PRP in-house G Federal Facility in-house G Other _____	G Contractor for State G Contractor for PRP G Contractor for Federal Facility																																																													
2.	O&M Cost Records G Readily available G Up to date G Funding mechanism/agreement in place Original O&M cost estimate _____ G Breakdown attached <div style="text-align: center;">Total annual cost by year for review period if available</div> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 15%;">From _____</td> <td style="width: 15%;">To _____</td> <td style="width: 15%;"></td> <td style="width: 15%;"></td> <td style="width: 15%;"></td> <td style="width: 20%;">G Breakdown attached</td> </tr> <tr> <td style="text-align: center;">Date</td> <td style="text-align: center;">Date</td> <td style="text-align: center;">Total cost</td> <td colspan="3"></td> </tr> <tr> <td>From _____</td> <td>To _____</td> <td></td> <td></td> <td></td> <td>G Breakdown attached</td> </tr> <tr> <td style="text-align: center;">Date</td> <td style="text-align: center;">Date</td> <td style="text-align: center;">Total cost</td> <td colspan="3"></td> </tr> <tr> <td>From _____</td> <td>To _____</td> <td></td> <td></td> <td></td> <td>G Breakdown attached</td> </tr> <tr> <td style="text-align: center;">Date</td> <td style="text-align: center;">Date</td> <td style="text-align: center;">Total cost</td> <td colspan="3"></td> </tr> <tr> <td>From _____</td> <td>To _____</td> <td></td> <td></td> <td></td> <td>G Breakdown attached</td> </tr> <tr> <td style="text-align: center;">Date</td> <td style="text-align: center;">Date</td> <td style="text-align: center;">Total cost</td> <td colspan="3"></td> </tr> <tr> <td>From _____</td> <td>To _____</td> <td></td> <td></td> <td></td> <td>G Breakdown attached</td> </tr> <tr> <td style="text-align: center;">Date</td> <td style="text-align: center;">Date</td> <td style="text-align: center;">Total cost</td> <td colspan="3"></td> </tr> </table>			From _____	To _____				G Breakdown attached	Date	Date	Total cost				From _____	To _____				G Breakdown attached	Date	Date	Total cost				From _____	To _____				G Breakdown attached	Date	Date	Total cost				From _____	To _____				G Breakdown attached	Date	Date	Total cost				From _____	To _____				G Breakdown attached	Date	Date	Total cost			
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3.	Unanticipated or Unusually High O&M Costs During Review Period Describe costs and reasons: _____ _____ _____ _____ _____																																																														
V. ACCESS AND INSTITUTIONAL CONTROLS G Applicable G N/A																																																															
A. Fencing																																																															
1.	Fencing damaged Remarks _____	G Location shown on site map	G Gates secured	G N/A																																																											
B. Other Access Restrictions																																																															
1.	Signs and other security measures Remarks _____	G Location shown on site map	G N/A																																																												

C. Institutional Controls (ICs)				
1.	Implementation and enforcement			
	Site conditions imply ICs not properly implemented		G Yes	G No G N/A
	Site conditions imply ICs not being fully enforced		G Yes	G No G N/A
	Type of monitoring (e.g., self-reporting, drive by) _____			
	Frequency _____			
	Responsible party/agency _____			
	Contact _____			
	Name	Title	Date	Phone no.
	Reporting is up-to-date		G Yes	G No G N/A
	Reports are verified by the lead agency		G Yes	G No G N/A
	Specific requirements in deed or decision documents have been met		G Yes	G No G N/A
	Violations have been reported		G Yes	G No G N/A
	Other problems or suggestions: G Report attached			

2.	Adequacy	G ICs are adequate	G ICs are inadequate	G N/A
	Remarks	_____		

D. General				
1.	Vandalism/trespassing	G Location shown on site map	G No vandalism evident	
	Remarks	_____		

2.	Land use changes on site	G N/A		
	Remarks	_____		

3.	Land use changes off site	G N/A		
	Remarks	_____		

VI. GENERAL SITE CONDITIONS				
A. Roads	G Applicable	<input checked="" type="checkbox"/> N/A		
1.	Roads damaged	G Location shown on site map	G Roads adequate	G N/A
	Remarks	_____		

B. Other Site Conditions			
Remarks _____ _____ _____ _____ _____			
VII. LANDFILL COVERS G Applicable X N/A			
A. Landfill Surface			
1.	Settlement (Low spots) Areal extent _____ Depth _____ Remarks _____	G Location shown on site map Depth _____	G Settlement not evident
2.	Cracks Lengths _____ Widths _____ Remarks _____	G Location shown on site map Depths _____	G Cracking not evident
3.	Erosion Areal extent _____ Remarks _____	G Location shown on site map Depth _____	G Erosion not evident
4.	Holes Areal extent _____ Remarks _____	G Location shown on site map Depth _____	G Holes not evident
5.	Vegetative Cover G Grass G Cover properly established G Trees/Shrubs (indicate size and locations on a diagram) Remarks _____		G No signs of stress
6.	Alternative Cover (armored rock, concrete, etc.) Remarks _____	G N/A	
7.	Bulges Areal extent _____ Remarks _____	G Location shown on site map Height _____	G Bulges not evident

8.	Wet Areas/Water Damage G Wet areas G Ponding G Seeps G Soft subgrade Remarks _____	G Wet areas/water damage not evident G Location shown on site map G Location shown on site map G Location shown on site map G Location shown on site map Areal extent _____ Areal extent _____ Areal extent _____ Areal extent _____
9.	Slope Instability Areal extent _____ Remarks _____	G Slides G Location shown on site map G No evidence of slope instability
B. Benches G Applicable G N/A (Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)		
1.	Flows Bypass Bench Remarks _____	G Location shown on site map G N/A or okay
2.	Bench Breached Remarks _____	G Location shown on site map G N/A or okay
3.	Bench Overtopped Remarks _____	G Location shown on site map G N/A or okay
C. Letdown Channels G Applicable G N/A (Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)		
1.	Settlement Areal extent _____ Remarks _____	G Location shown on site map G No evidence of settlement Depth _____
2.	Material Degradation Material type _____ Remarks _____	G Location shown on site map G No evidence of degradation Areal extent _____
3.	Erosion Areal extent _____ Remarks _____	G Location shown on site map G No evidence of erosion Depth _____

4.	Undercutting	<input type="checkbox"/> Location shown on site map	<input type="checkbox"/> No evidence of undercutting
	Areal extent _____	Depth _____	
	Remarks _____		
5.	Obstructions	Type _____	<input type="checkbox"/> No obstructions
	<input type="checkbox"/> Location shown on site map	Areal extent _____	
	Size _____		
	Remarks _____		
6.	Excessive Vegetative Growth	Type _____	
	<input type="checkbox"/> No evidence of excessive growth		
	<input type="checkbox"/> Vegetation in channels does not obstruct flow		
	<input type="checkbox"/> Location shown on site map	Areal extent _____	
	Remarks _____		
D. Cover Penetrations <input type="checkbox"/> Applicable <input type="checkbox"/> N/A			
1.	Gas Vents	<input type="checkbox"/> Active	<input type="checkbox"/> Passive
	<input type="checkbox"/> Properly secured/locked	<input type="checkbox"/> Functioning	<input type="checkbox"/> Routinely sampled <input type="checkbox"/> Good condition
	<input type="checkbox"/> Evidence of leakage at penetration	<input type="checkbox"/> Needs Maintenance	
	<input type="checkbox"/> N/A		
	Remarks _____		
2.	Gas Monitoring Probes	<input type="checkbox"/> Properly secured/locked	<input type="checkbox"/> Functioning <input type="checkbox"/> Routinely sampled <input type="checkbox"/> Good condition
	<input type="checkbox"/> Evidence of leakage at penetration	<input type="checkbox"/> Needs Maintenance	<input type="checkbox"/> N/A
	Remarks _____		
3.	Monitoring Wells (within surface area of landfill)	<input type="checkbox"/> Properly secured/locked	<input type="checkbox"/> Functioning <input type="checkbox"/> Routinely sampled <input type="checkbox"/> Good condition
	<input type="checkbox"/> Evidence of leakage at penetration	<input type="checkbox"/> Needs Maintenance	<input type="checkbox"/> N/A
	Remarks _____		
4.	Leachate Extraction Wells	<input type="checkbox"/> Properly secured/locked	<input type="checkbox"/> Functioning <input type="checkbox"/> Routinely sampled <input type="checkbox"/> Good condition
	<input type="checkbox"/> Evidence of leakage at penetration	<input type="checkbox"/> Needs Maintenance	<input type="checkbox"/> N/A
	Remarks _____		
5.	Settlement Monuments	<input type="checkbox"/> Located	<input type="checkbox"/> Routinely surveyed <input type="checkbox"/> N/A
	Remarks _____		

E. Gas Collection and Treatment		G Applicable	G N/A
1.	Gas Treatment Facilities G Flaring G Thermal destruction G Collection for reuse G Good condition G Needs Maintenance Remarks _____		
2.	Gas Collection Wells, Manifolds and Piping G Good condition G Needs Maintenance Remarks _____		
3.	Gas Monitoring Facilities (e.g., gas monitoring of adjacent homes or buildings) G Good condition G Needs Maintenance G N/A Remarks _____		
F. Cover Drainage Layer		G Applicable	G N/A
1.	Outlet Pipes Inspected Remarks _____		
2.	Outlet Rock Inspected Remarks _____		
G. Detention/Sedimentation Ponds		G Applicable	G N/A
1.	Siltation Areal extent _____ Depth _____ G N/A G Siltation not evident Remarks _____		
2.	Erosion Areal extent _____ Depth _____ G Erosion not evident Remarks _____		
3.	Outlet Works G Functioning G N/A Remarks _____		
4.	Dam G Functioning G N/A Remarks _____		

H. Retaining Walls		<input type="checkbox"/> Applicable	<input type="checkbox"/> N/A
1.	Deformations Horizontal displacement _____ Rotational displacement _____ Remarks _____	<input type="checkbox"/> Location shown on site map	<input type="checkbox"/> Deformation not evident
2.	Degradation Remarks _____	<input type="checkbox"/> Location shown on site map	<input type="checkbox"/> Degradation not evident
I. Perimeter Ditches/Off-Site Discharge		<input type="checkbox"/> Applicable	<input type="checkbox"/> N/A
1.	Siltation Areal extent _____ Depth _____ Remarks _____	<input type="checkbox"/> Location shown on site map	<input type="checkbox"/> Siltation not evident
2.	Vegetative Growth G Vegetation does not impede flow Areal extent _____ Type _____ Remarks _____	<input type="checkbox"/> Location shown on site map	<input type="checkbox"/> N/A
3.	Erosion Areal extent _____ Depth _____ Remarks _____	<input type="checkbox"/> Location shown on site map	<input type="checkbox"/> Erosion not evident
4.	Discharge Structure Remarks _____	<input type="checkbox"/> Functioning	<input type="checkbox"/> N/A
VIII. VERTICAL BARRIER WALLS		<input type="checkbox"/> Applicable	<input type="checkbox"/> N/A
1.	Settlement Areal extent _____ Depth _____ Remarks _____	<input type="checkbox"/> Location shown on site map	<input type="checkbox"/> Settlement not evident
2.	Performance Monitoring Type of monitoring _____ G Performance not monitored Frequency _____ Head differential _____ Remarks _____		<input type="checkbox"/> Evidence of breaching

IX. GROUNDWATER/SURFACE WATER REMEDIES		G Applicable	X N/A
A. Groundwater Extraction Wells, Pumps, and Pipelines		G Applicable	G N/A
1.	Pumps, Wellhead Plumbing, and Electrical G Good condition G All required wells properly operating G Needs Maintenance G N/A Remarks _____ _____		
2.	Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances G Good condition G Needs Maintenance Remarks _____ _____		
3.	Spare Parts and Equipment G Readily available G Good condition G Requires upgrade G Needs to be provided Remarks _____ _____		
B. Surface Water Collection Structures, Pumps, and Pipelines		G Applicable	G N/A
1.	Collection Structures, Pumps, and Electrical G Good condition G Needs Maintenance Remarks _____ _____		
2.	Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances G Good condition G Needs Maintenance Remarks _____ _____		
3.	Spare Parts and Equipment G Readily available G Good condition G Requires upgrade G Needs to be provided Remarks _____ _____		

C. Treatment System		G Applicable	G N/A
1.	Treatment Train (Check components that apply) G Metals removal G Oil/water separation G Bioremediation G Air stripping G Carbon adsorbers G Filters _____ G Additive (e.g., chelation agent, flocculent) _____ G Others _____ G Good condition G Needs Maintenance G Sampling ports properly marked and functional G Sampling/maintenance log displayed and up to date G Equipment properly identified G Quantity of groundwater treated annually _____ G Quantity of surface water treated annually _____ Remarks _____		
2.	Electrical Enclosures and Panels (properly rated and functional) G N/A G Good condition G Needs Maintenance Remarks _____		
3.	Tanks, Vaults, Storage Vessels G N/A G Good condition G Proper secondary containment G Needs Maintenance Remarks _____		
4.	Discharge Structure and Appurtenances G N/A G Good condition G Needs Maintenance Remarks _____		
5.	Treatment Building(s) G N/A G Good condition (esp. roof and doorways) G Needs repair G Chemicals and equipment properly stored Remarks _____		
6.	Monitoring Wells (pump and treatment remedy) G Properly secured/locked G Functioning G Routinely sampled G Good condition G All required wells located G Needs Maintenance G N/A Remarks _____		
D. Monitoring Data			
1.	Monitoring Data G Is routinely submitted on time G Is of acceptable quality		
2.	Monitoring data suggests: G Groundwater plume is effectively contained G Contaminant concentrations are declining		

D. Monitored Natural Attenuation			
1.	Monitoring Wells (natural attenuation remedy) <input type="checkbox"/> Properly secured/locked <input type="checkbox"/> Functioning <input type="checkbox"/> Routinely sampled <input type="checkbox"/> Good condition <input type="checkbox"/> All required wells located <input type="checkbox"/> Needs Maintenance <input type="checkbox"/> N/A Remarks _____		
X. OTHER REMEDIES			
If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.			
see attached			
XI. OVERALL OBSERVATIONS			
A. Implementation of the Remedy			
Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.). Wave barriers are intended to minimize future releases of contaminated sediments and marsh sediments by protecting Swan Lake from waves associated with storms or hurricanes. The barriers are in excellent condition and they are capable of performing as intended.			
B. Adequacy of O&M			
Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy. No O&M procedures have been conducted. They have not been needed. The remedy remains protective currently and for the long term.			

C. Early Indicators of Potential Remedy Problems

Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future.

There was no indication that repairs are needed. Wave barriers withstood Hurricane Ike (2008), a category 2 hurricane that made landfall at Galveston, with no apparent damage. Protectiveness does not seem likely to be compromised in the future, even with little or no O&M and no repairs.

D. Opportunities for Optimization

Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

Remedy seems optimal "as is" because it remains protective without O&M and/or repairs.

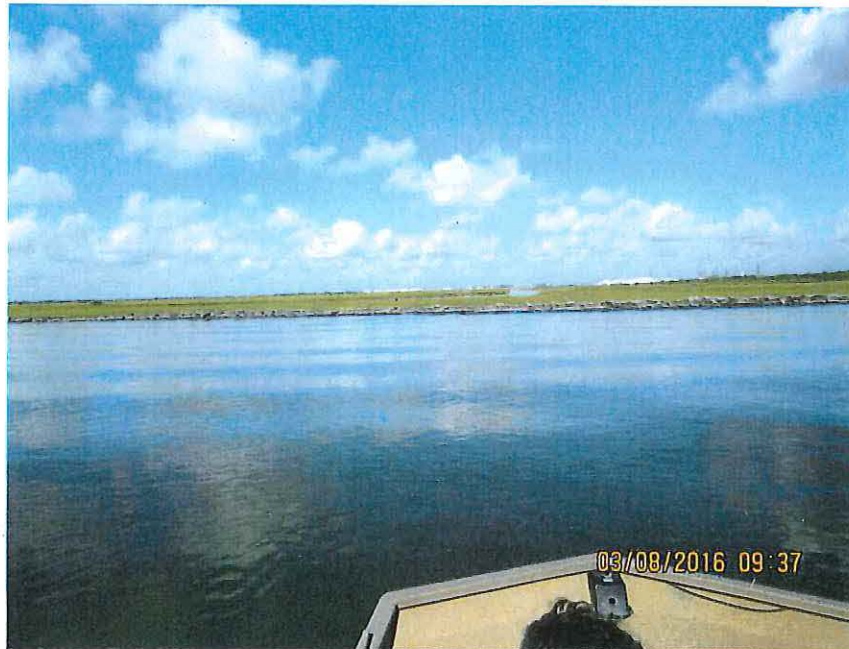
X. OTHER REMEDIES

There are five wave barriers protecting Swan Lake from waves off of Galveston Bay, including one that was built by others and four that were built as part of the OU 4 remedy (see map in Supplemental FYR Appendix B). The wave barriers are breakwaters or jetties, each 1,000 to 1,800 feet long. The barriers are founded on the bottom of the bay in water that is less than 10 feet deep and they extend upward to the water surface. They have wide bases tapering to a width of about 10 feet wide at the top. They are constructed of piled-up riprap rocks, with each rock having minimum dimensions of approximately 2 or 3 feet. The rocks appear to have remained in their original configuration, with a flat surface on the top of each barrier and continuous uniform grade breaks where the tops meet the slopes angling into the water. No rocks appear to have been broken or removed since construction was completed, and there is no evidence of uneven settling along the length of the barriers. The barriers serve as perches for birds and the rocks have collected only minimal amounts of debris.

APPENDIX D - PHOTOGRAPHS



**Site Inspection Photographs
Tex Tin Corporation Superfund Site
Operable Unit No. 4**

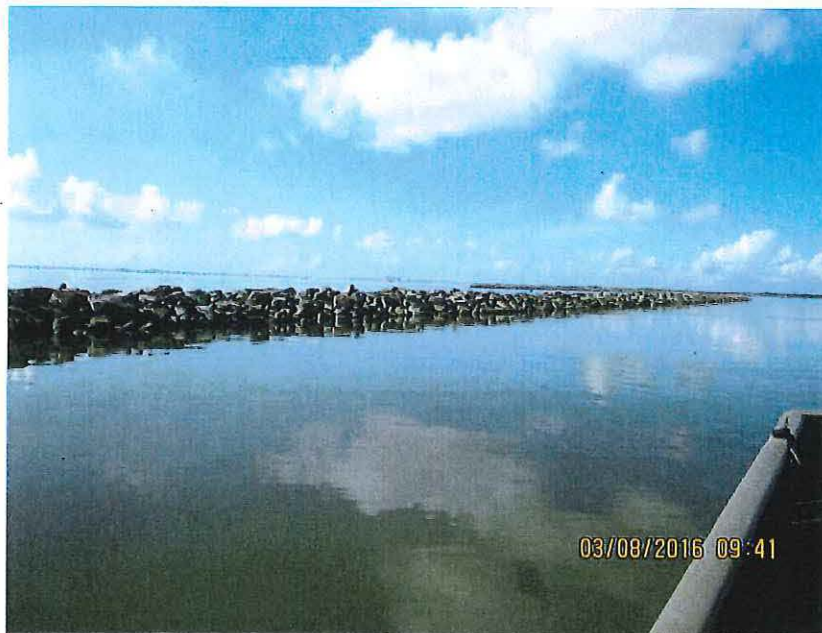


Photograph No. 1

Description: Preexisting (northernmost) wave barrier at north edge of Swan Lake, with Swan Lake marsh beyond.

Date: 8/3/2016

Direction of View: West



Photograph No. 2

Description: Shoreward side of first wave barrier.

Date: 8/3/2016

Direction of View: South

**Site Inspection Photographs
Tex Tin Corporation Superfund Site
Operable Unit No. 4**



Photograph No. 3

Description: Shoreward side of second wave barrier.

Date: 8/3/2016

Direction of View: Northeast



Photograph No. 4

Description: Swan Lake Marsh.

Date: 8/3/2016

Direction of View: Northwest

**Site Inspection Photographs
Tex Tin Corporation Superfund Site
Operable Unit No. 4**



Photograph No. 5
Description: Shoreward side of third wave barrier.
Date: 8/3/2016

Direction of View: Southeast



Photograph No. 6
Description: North side of fourth (southernmost) wave barrier, with Swan Lake Marsh in background and Malone Superfund Site beyond.
Date: 8/3/2016

Direction of View: Southwest

**Site Inspection Photographs
Tex Tin Corporation Superfund Site
Operable Unit No. 4**



Photograph No. 7

Description: South side of southernmost (fourth) wave barrier, third wave barrier in the background

Date: 8/3/2016

Direction of View: Northeast



Photograph No. 8

Description: Bay side of third wave barrier, second wave barrier in the distance, Swan Lake Marsh beyond.

Date: 8/3/2016

Direction of View: North